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CALIFORNIA RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

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California Energy Commission Demand Side Programs

Overview

Under Division 15, Section 25000 et seq. of the Public Resources Code, the California Energy Commission administers a broad portfolio of programs designed to help businesses and consumers improve energy efficiency, reduce peak electricity demand, and reduce their energy costs in residential and commercial buildings in California. This document provides an overview of the Energy Commission's programs related to energy efficiency, distributed generation, and demand management.

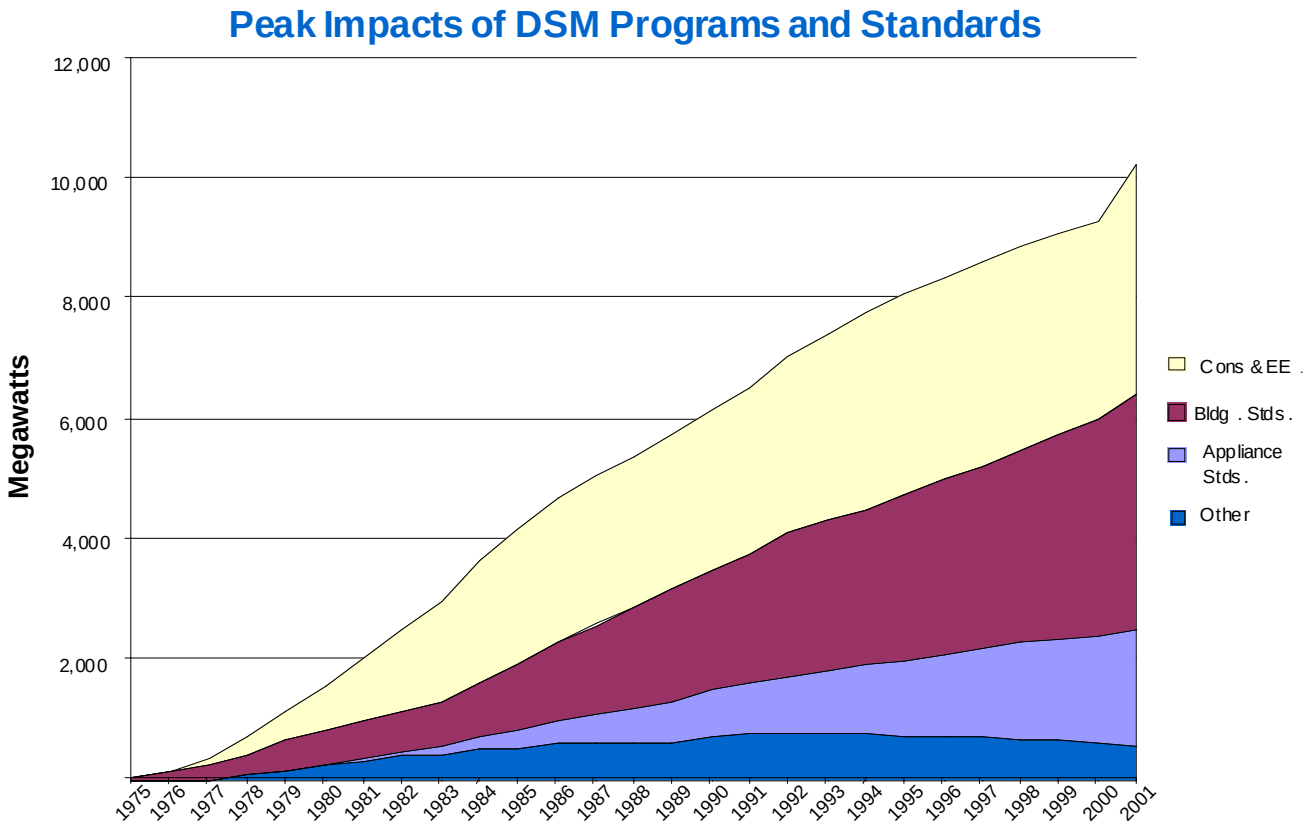
In the mid-1970s the California Legislature and Governor made a profound decision to promote energy efficiency in our state. This was part of a long-term, balanced portfolio of strategies to enhance economic growth and environmental quality. They enacted legislation establishing energy efficiency standards for all new buildings and appliances and directed the Energy Commission to administer these programs.

These efficiency standards have provided a steady foundation for energy savings, quietly guaranteeing that Californians save on their home and business electricity and gas bills. Our population lives and works in the most efficient buildings in the nation, and uses the most efficient appliances in America. Through changing budgets and administrations, these standards have been constantly improved, insuring that new, cost-effective, technologies and building methods are part of their design. Meanwhile, the Energy Commission’s research and development program is undertaking projects that will serve to keep the efficiency standards current as new technologies and opportunities arise.

In the year 2000, the standards alone saved 17,641 gigawatt hours, 2.5 billion therms of natural gas, and reduced California’s peak electricity demand by 5,380 megawatts (MW), roughly 10% of the state’s 2000 peak load of 50,300 MW.

Over the years, the Energy Commission has undertaken a portfolio of efficiency efforts. We provide technical and financial assistance to public agencies and hospitals for cost-effective energy efficiency investments. The Commission’s Energy Conservation Assistance Act Program has been delivering energy savings to taxpayers throughout the State for over 20 years. The Energy Commission has been in

the forefront of efforts to improve the efficiency of California's public schools. Working with stakeholders, we have established the Collaborative for High Performance Schools (CHPS).



Energy efficiency standards and programs have been saving energy since 1975.

The Energy Commission assists water and wastewater agencies in reducing their electricity needs, while promoting distributed generation. In agriculture and food processing, the Energy Commission provides technical and financial assistance to help these industries cut their energy costs and remain competitive. Additionally, the Energy Commission conducts R&D projects to develop new technologies, to reduce the energy cost of water and wastewater treatment, agricultural activity, and industrial production.

As the State's "Energy Office," the Energy Commission directs federal funding to improve the effectiveness of the building standards, introduce efficient technologies to industry, and improve energy efficiency in underserved areas.

Our mandate includes regularly developing a long-term demand forecast to incorporate efficiency programs into the State's assessment of need and determine the need for new supply facilities. These forecasts provide information critical to the design of efficiency programs and serve as the basis for planning and assessment during California's current energy challenge.

In response to the challenge, the Energy Commission undertook a slate of new programs to reduce the state's peak electricity demand. Legislation allocated over $350 million to the Energy Commission to tackle the challenge of reducing peak load. As of now, these programs already provide over 950 Megawatts of peak reduction potential and that number is growing monthly.

We will have more detail on these efforts later on this document.

Residential Sector Programs

Chapter 5 of the Public Resources Code, Section 25400 et seq. directs the Energy Commission to undertake a great number of activities to reduce "wasteful, inefficient, unnecessary, or uneconomic uses of energy." The Energy Commission's residential programs are designed to fill California residents' desire to live in clean, comfortable and efficient homes that create minimal impacts on their local environment.

The Energy Commission accomplishes this goal by supporting research on more efficient designs and materials, developing new building and appliance standards to incorporate the best of these efforts into new building design, and providing customers and vendors with access to the most up to date information on the performance and cost of energy efficient products. The Energy Commission has led the nation in improving residential sector energy efficiency.

Residential Building Standards

California continues to lead the nation in developing more energy efficient designs, equipment and building materials for the new construction market. Since the mid-1970s the Energy Commission's building standards have provided Californians with more comfortable and energy efficient structures in which to live and work. The standards ensure that each year's stock of new residential and commercial buildings have cost-effective efficiency built permanently into them. Since efficiency measures first were mandated in new construction, the benefits for the occupants and for California as a whole have been enormous. Homes built today are at least 75 percent more efficient than homes built before 1975.

The Energy Commission has long recognized that the standards achieve their intended savings only if the building community and the building departments understand how to comply with and enforce the requirements. We write manuals explaining the compliance options, develop computer programs for performance compliance, provide a quarterly newsletter, and operate a telephone hotline to answer questions on the spot. We support the standards through training building departments and builders (described in greater detail below). Energy Commission staff participate in various conferences and trade association meetings to constantly inform key players about existing requirements and what to expect in the future.

The latest set of standards, designed to focus on reducing peak electricity use, were developed in an incredibly fast 119 days in response to Assembly Bill 970. These standards will achieve an additional 200 MW savings per year of construction, that is 200 MW in the first year, 400 MW in the second, etc. These standards focus on air conditioner system improvements, from better duct connections to checks for proper refrigerant charge.

In the next generation of standards, planned to go into effect in 2005, we are looking at continued improvements in residential air conditioning and water heating systems among other features.

Training Builders

The home building industry generates nearly $69 billion to California's economy each year while adding over 100,000 new housing units. Training production homebuilders in California is a 5-year-old

program funded through the federal Department of Energy (DOE). This program is a shining example of helping homebuilders understand and implement the requirements of the building energy efficiency code and how it relates to their business. California is unique in that the vast majority of home construction is done by large, production building companies. (Other states rarely have builders that construct more than 100 homes per year.) Training is provided to a range of personnel from vice presidents to site supervisors working for production California builders, so that it can be duplicated over and over again in the production process.

Residential Appliance Standards

The Energy Commission was the first in the nation to develop and enforce efficiency standards for appliances. These standards had a spill-over effect, in that many manufacturers found it too troublesome to produce appliances especially for California, thus California efficiencies were often sold throughout the nation. In the early 1990s the DOE followed our lead and adopted the existing California appliance standards as national efficiency standards.

The Energy Commission adopted new energy efficiency standards for appliances earlier this year, adding several new appliance types to the regulations. Appliances newly covered are torchiere light fixtures, coin-operated refrigerated vending machines, commercial refrigerators and freezers, emergency lighting, traffic signals, commercial clothes washers, and low-voltage dry-type distribution transformers. These new appliance types will improve the reduction in peak by another 115 MWs per year.

One of the important aspects of the new appliance regulations is the improved efficiency requirement for air conditioners. The Energy Commission adopted a 13 SEER with an 11.3 EER (and a thermostatic expansion valve or equivalent) to better reflect the hot dry climate of California. But because air conditioners are covered by federal appliance standards, the Energy Commission must gain a waiver from federal preemption in order to enforce the new, higher efficiencies. The Energy Commission will be developing and seeking such a waiver this year, setting a new precedent, as no state has yet attempted this process.

Flex Your Power

The Flex Your Power campaign works because of the combined efforts of several state agencies. The Energy Commission roles are developing new informational materials and programs, reviewing the accuracy of information developed by other agencies, and "getting the word out." The Energy Commission developed the first "Warm Weather Tips" for the State and Consumer Services Agency and helped distribute them statewide. The Energy Commission participated in their various program design meetings for various initiatives. We review point of purchase materials and television/radio advertisement for accuracy.

Residential Retrofit Standards Study

Existing buildings, obviously, make up the vast majority of the building stock. They always present the greatest challenge for program administrators to find workable mechanisms to improve energy efficiency and reduce peak energy use. Assembly Bill 549 (chaptered October 14, 2001) requires the Energy Commission to report to the legislature on ways to reduce peak in existing residential and nonresidential buildings, and to identify any needed new authority to carry out appropriate programs. The report is required by January 1, 2004. The Energy Commission will be investigating, in conjunction

with possible affected stakeholders, a myriad of options from simple informational pamphlets to mandatory standards, along with the various implementation strategies. Such strategies include upgrades at point of sale, informational advertisements, and building department enforcement. Look for meeting notices on our web site.

Residential Demand Responsive Pilot Project

The Energy Commission's Residential Demand Responsive Pilot Project will test data networking technologies for energy management and appliance control in new and existing homes in California. The pilot will be conducted on 300 – 500 homes in the Sacramento and the Walnut Creek/Danville/San Ramon areas. We expect savings of .75 to 1.5 kW per house. The pilot will evaluate the effectiveness of different marketing approaches and education efforts in assisting homeowners better understand the implications of the "time of use" of electricity and behavioral changes they can take to reduce electricity use during these times. The evaluation will also test the homeowners' response to information and education on the home as a system and potential additional benefits available through conservation and energy efficiency efforts. The results of these pilots are expected to support future deployment decisions of improved interval metering systems for residential customers.

Photovoltaics/Renewables

The Energy Commission's renewable energy program promotes the installation of photovoltaics, small wind turbines, fuel cells, and solar thermal electricity systems. This is funded through Public Good Charge funds, collected by the State's investor-owned utilities. The Energy Commission promotes renewable energy using a variety of strategies. Besides education, outreach, and specific training for installers and building departments, we offer incentives for renewable energy installations. The Energy Commission is offering cash rebates on eligible renewable energy electricity-generating systems through the Emerging Renewables Buydown Program, offering $4,500 per kilowatt, or 50 percent of the system purchase price (whichever is less). To date, 2,600 of these residential and small commercial-sized systems have been installed, resulting in 9 MW of generation. 1,200 projects are in the "pipeline" with an additional 10 MW expected. The funding for this program has been approved for another 10 years. The Energy Commission is also working with Franchise Tax Board to administer the tax credit for solar and wind systems for taxable years of 2001 through 2005.

Nonresidential Sectors Programs

The Energy Commission has developed an extensive array of programs designed to reduce building energy costs through investments in better design and energy efficient systems in the nonresidential sectors. In this context "nonresidential" includes commercial buildings and the agriculture, water, wastewater, and industrial process sectors. These programs have developed after extensive interaction with groups involved in the various sectors, e.g., architects, engineers, suppliers, etc.

The Energy Commission funds the ongoing efficiency programs through the electricity surcharge, Petroleum Violation Escrow Account, and federal State Energy Program (SEP). Through the SEP, the DOE funds portions of various Energy Commission programs. This affects a number of our programs, including building standards. In addition, as the designated state energy agency, the Energy Commission implements a variety of federal initiatives including Rebuild America and National Industrial Competitiveness through Energy Environment and Economics ($NICE^3$). These programs are very

successful collaborations, particularly as mechanisms to create public/private partnerships (Rebuild) and to commercialize innovative products and processes (NICE^3).

Nonresidential Building and Appliance Standards

The most recent version of the standards focused on air conditioning and better duct construction. The next round will focus on the evaluation of specific measures in terms of their impact by time of day. These will also be a new section on outdoor lighting requirements. In the commercial sector, builders and building owners often do not pay the energy bills for new buildings, giving them little incentive to invest in improving efficiency. As a result, the building and appliance standards are the most cost effective, reliable strategy to achieve energy efficiency gains in this sector. One indication of the effectiveness of commercial and residential building standards and appliance standards is that between 1990 and 2000 the population in California grew 13.8% but electricity consumption only grew 1.2%.

Federal Initiatives

Through the Rebuild America program the Energy Commission has received $670,000 for grants since 1997. The Energy Commission has arranged partnerships with those funds, involving regional energy agencies (San Diego Regional Energy Office); youth training agencies (California Conservation Corps); schools and utilities.

NICE^3 is a cost sharing DOE grant program to advance U.S. industrial competitiveness by providing financial assistance to state and industry partnerships for commercial demonstrations of energy efficiency and pollution prevention technologies. The Energy Commission has received $8.2 million and funded $25 million in projects. Examples include:

- A commercialized system that totally removes bleach from effluent discharged from a pulp mill.
- Development of an energy efficient and cost effective way to recycle and reuse high value plastics in manufacturing processes.

Public Agency Programs

For over 20 years the Energy Commission has provided technical assistance and financing to schools and local jurisdictions for energy efficiency measures. Since the beginning of the program, the Energy Commission has awarded $140 million to 658 agencies. As a result, these jurisdictions are saving $23 million per year in energy costs. During the last year and one half $60 million has been loaned as part of the administration's Peak Load Reduction Program.

In the past two years the Energy Commission has led the Collaborative for High Performance Schools (CHPS). The collaborative (which is now a non-profit corporation) has developed an extensive "best practices" manual for the design and construction of energy efficient schools. The collaborative has also sponsored and conducted numerous training sessions for architects and school officials, a popular program amongst stakeholders.

A major initiative funded by the AB970 and SB5X program is the Cool Roof Program. This involves putting reflective coatings on roofs, which reduces air conditioning loads. This program should result in savings of almost 12 MW by the end of summer 2002.

Agriculture Initiatives

The Energy Commission provides technical assistance and loans for agricultural businesses to reduce energy, water and chemical use, coordinating with UC Davis to establish goals and objectives for the program. This program has loaned $4.7 million for industry to acquire new emerging technologies. In addition, grants totaling $37 million have been given to universities, state universities and industry partners for improvements in equipment and processes. These projects have encompassed a broad range of activities including pump improvements, educational materials and courses, peak reduction strategies, and use of animal waste to generate electricity. These investments save over 55 MW of peak power and save the equivalent of 100,000 million Btu's of petroleum-based inputs such as diesel fuel, pesticides, and fertilizers per year.

Water/Wastewater

The Energy Commission funds technical assistance for water and wastewater agencies to improve energy efficiency. There are over 8,000 such agencies in California, eligible for both technical assistance and low interest financing. Recently, through the funding provided by SB5X and AB970, the Energy Commission has provided over $8 million in grants to water and wastewater agencies to reduce their peak load needs. The goal is to reduce at least 20 MW of peak demand in the short term.

Load Management Standards

The Energy Commission has authority to adopt load management standards, to reduce load during peak demand periods. In the past, the Commission has focused on control of specific loads. For example, the Commission is now working to develop more sophisticated load management opportunities. The primary option under development is “demand responsive” building systems. By assisting building owners to reduce their electrical loads during system alerts, demand responsive systems reduce the chance of blackouts and help to keep electricity prices down. The Commission is assisting with installation of real time metering, to assist customers in making efficient decisions regarding their energy use. The Energy Commission pioneered the development of direct load control programs and time of use rates in the early 1980s and hopes to work with the CPUC to achieve much greater demand responsiveness in the electricity market by developing a new generation of standards and programs. Details of this plan can be found in the Energy Commission’s "Draft Plan to Achieve Greater Demand Response in the Electricity Market."
(http://www.energy.ca.gov/peakload/documents/index.html#workshops)

Multi-Sector Activities

The Energy Commission has both ongoing and issue-specific responsibilities that cut across customer classes. This section briefly describes multi-sector efficiency programs as well as distributed generation and end use related research and development.

Demand Forecasting and Analysis

One of the Energy Commission’s principal missions is to provide the Legislature and Governor with an independent analysis of emerging trends in California’s energy markets. As part of this mission, the Energy Commission was the first agency to foresee the electricity reliability crisis by forecasting a shortage of supply in 1998, two years before the actual crunch hit in 2000. Critical to this mission is the

ability to gather data on energy markets, new supplies, and the resulting prices, in order to forecast future supply and demand conditions and identify any emerging economic or environmental challenges.

Through the years, as prescribed by law, the Energy Commission has provided biennial demand forecasts to establish need for new electricity supply resources, and to monitor the sufficiency of natural gas supplies. With the advent of the recent energy crisis, our conservation and efficiency estimates and demand analysis are continuously supplied to the Governor's Office. The Governor and his staff have been using this information to help pull California out of the crisis from last year, rapidly developing conservation and efficiency programs. This year our demand forecasts were used to develop scenarios for determining the impacts on energy consumption of varying levels of efficiency efforts by Californians in the post-2001 energy crisis environment.

The forecast process helps to evaluate the range of uncertainties about future efficiency, the effects of economic and demographic growth, and other structural changes in the way California consumes energy. With this information we can better plan for a mix of both demand reduction and new supply options for levels of energy consumption in a highly variable energy market.

Consumer Research

The Energy Commission is conducting consumer research on how customers react to changing energy prices, markets, and reliability conditions. Understanding how consumers think about and use energy is vital information for both forecasting demand and planning effective efficiency programs. All too often, however, the consumer response is overlooked or taken for granted. Prompted by the reliability uncertainties in 2001, the Energy Commission recognized a unique opportunity to learn about consumer conservation decision-making. The Energy Commission has funded a comprehensive study of consumer response to summer 2001 and beyond. Preliminary analysis is proving that consumers demonstrate more flexibility and adaptability in using energy than energy policy analysts and program planners had imagined.

Research and Development

The Energy Commission invests Public Goods Charge funds, collected by the investor-owned utilities in research through the Public Interest Energy Research Program (PIER). The program sponsors research in advanced generation technologies, energy systems integration, renewable generation technologies, building efficiency technologies, and process/industrial efficiency technologies. The remainder of this section focuses on the end use efficiency research.

The industrial research efforts are currently directed toward high technology research and manufacturing, and oilfield efficiency. PIER is helping Lawrence Berkeley National Laboratory in developing an efficient fume hood and clean room designs. The PIER program is working with the University of Southern California in developing more efficient approaches to heavy oil extraction in California's oilfields.

PIER is working with the Metropolitan Water District, the Contra Costa County Water District, and the Orange County Water District, among others, to develop more energy efficient methods to treat both imported and local water for safe, potable purposes.

In agriculture, PIER has been working with the University of California at Davis on "precision farming" techniques and irrigation scheduling technologies, to reduce use of water and the accompanying pumping load on the electricity supply system. This work is augmented with research in ozonation and membrane development to allow efficient recovery of water used in irrigation and food processing.

In the building sector, much of the research is geared to support more effective building standards. PIER is developing tools for evaluating building practices and systems to determine where improvement can provide the greatest efficiency benefits. This work underlies the recent improvements in building duct efficiency requirements. Daylighting and its contribution to productivity are being investigated, along with improvements in design on portable classrooms and school construction methods. Current research includes the issue of indoor air quality, to insure that tighter building standards still provide healthy indoor environments. PIER-funded research on heating, ventilation and air conditioning system efficiency will provide long-term benefits for California, both year-round, as well as during summer peak hours, when air conditioning places a tremendous load on the state's electricity system.

PIER-funded research is being coordinated with the investor owned utilities in the state through the Emerging Technology Coordinating Council. This both insures that the research will provide useful results and provides an outlet to commercialize the products of PIER efforts.

Distributed Generation Activities

Distributed generation is one of several focus areas of the PIER program, representing approximately 20 percent of all funding since the program's inception in 1998. As of mid-March 2002, PIER is helping fund 78 distributed generation-related projects. Most of the portfolio is focused both on reducing environmental impacts and costs of generating electricity. The range of projects is diverse, including efforts focusing on interconnection issues, market integration, grid effects, and market structure, as well as specific generating projects. A portion of the funding is related to technology transfer services, most notably technical assistance for the development of standardized interconnection rules.

Peak Demand Reduction Program

The Energy Commission has undertaken over $300 million in cost-effective new programs to address the recent energy crisis. Focusing on the state's summer peak demand, programs are providing savings for $300 per peak kW or less. Some of the projects involve long-term energy savings, as well as peak demand reductions, while others involve responding to system alerts, when electricity demand threatens to exceed supply.

This enterprise, to reduce demand rapidly, allowed the Energy Commission to pursue well-proven strategies, such as installation of more efficient equipment. It also allowed efforts that demonstrate new options for customers to reduce peak demand by controlling their own energy use, by using advanced metering and systems responding to energy alerts.

A number of these program elements are approaches that California has not tried before.

Demand-Responsive Program

During the recent energy emergency that faced California, the Energy Commission developed and implemented a program to recruit over 500 large and medium sized customers to install demand-

responsive systems in return for the customer's pledge to reduce load during reliability emergencies. Demand responsive systems include interval meters to provide customers accurate information on the time pattern of electricity use and communication devices to receive emergency or price signals from the ISO or UDC when system reliability is threatened and load reductions are needed. The goal is to design systems that can reduce electricity demand without affecting the comfort or productivity of building occupants. The Energy Commission's contractors provided incentives to install communication, metering, and controls systems and then developed emergency plans for building operators to follow when an automatic signal notifies building operators of an alert. These systems can either automatically or manually reduce building electricity demand by adjusting lighting levels or thermostats to reduce load by 10% to 40% in buildings.

The Energy Commission's program has installed demand responsive systems capable of providing over 250 MW of potential demand reduction within 30 minutes of an emergency signal. This was achieved at a total cost to the state of less than $100/kW for a three-year commitment. While this load relief may be very helpful to maintain reliable supplies of electricity in the coming summers, the new energy management control systems will be even more useful to customers once critical peak pricing or Real Time tariffs are adopted by the CPUC to provide customers with financial incentives to shave peak load whenever supplies get tight. The Energy Commission's demand responsive program funds the installation of the necessary hardware and software to make these systems work but the responsibility for providing accurate price signals to most of these customers remain with the CPUC.

The Energy Commission recently launched an Enhanced Automation publicity campaign designed to encourage building facility managers and engineers to invest in more building energy management controls, advanced metering systems and visual energy profile displays. The goal of this program is to channel the heightened concern and anxiety of energy managers about the California reliability crisis of 2000/2001 into the development of more sustainable building management and control systems that provide year round energy and productivity benefits for building as well as providing Californians with reliability insurance for the future. Technical guidebooks and case studies can be found on the program's website at www.consumerenergycenter.org/enhancedautomation.

Real Time Metering

AB 29X allocated $35 million to the Energy Commission to provide California electric utility customers having a peak electric demand of greater than 200 kW, with real time electric meters. To meet the mandate of the bill, the Energy Commission implemented its Real Time Metering Program in May 2001 and contracted with California electric utilities for the installation of 23,342 real time meters and related communications systems. The metering and communication system enables customers to view their energy usage either over the Internet, or in real time. We expect that the customers receiving these meters will be motivated to reduce California peak electric demand by a total of 600 MW due to the shift of many of these customers to time of use rates adopted by the CPUC and through customer participation in voluntary demand reduction programs available through the utilities and the Energy Commission. Also, these meters provide the infrastructure necessary for California to transition to "dynamic" electricity pricing, where tariffs better reflect the real cost of providing electricity to customers, especially during times of supply/demand imbalance. To date, almost 17,000 meters have been installed, and it is expected that installation of meters will be substantially complete by June 30, 2002. A Report to the Legislature on program activities is currently being prepared and should be available to the public after June 30, 2002.

Innovative Program

The Innovative Program, the broadest program in the portfolio of peak load reduction programs, taps the creative forces in the marketplace. This catch-all program provides incentives to commercial, industrial, and government end-users and to project aggregators. In addition, nine third-party contractors are administering programs targeting specific strategies and technologies in the commercial, industrial, government, and residential sectors. Incentives to contractors and end users average approximately $250 per kilowatt.

The Energy Commission found that large store chains use this program to help fund standard efficiency upgrades, such as improved lighting. They had not previously taken advantage of assistance through California's efficiency programs, because their stores were located in multiple utility service territories. The "Innovative" program provided them the option of going to one location, using one set of paperwork statewide, to get assistance.

The program secured a verified 16 MW of electric demand savings by the summer of 2001. A total of 108 MW of peak savings is expected by summer of 2002, with savings rising to 152 MW by June 2003. Total annual electric energy savings are projected to exceed 200 Gigawatt-hours per year.

Web Site

The Commission's web site has a wealth of information available to consumers, businesses and government agencies. At the height of the energy crisis, the site was getting 15 million hits per month, and of that, 5 million were for the Consumer Energy Center. Information available on the Commission's main web site includes peak load reduction programs, monthly peak load numbers and conservation statistics, the building and appliance standards and all related material, process energy program information, power plant licensing updates, renewable energy programs and incentives, as well as research and development programs. The Consumer Energy Center is structured in a simple, easy to use fashion. It is the source for consumer information on energy efficiency, energy rebates, transportation and renewable energy. The California Energy Rebate Database displays the rebates offered by all utilities and state agencies to help the consumer (and businesses) cut their electricity use, and links the user directly to utilities for additional information. Come visit the web sites at www.energy.ca.gov and www.ConsumerEnergyCenter.org

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